

# Virtual World News

All the news that can possibly fit on four pages for the VPL Research Virtual Reality Products user community

## A Spectrum of New Virtual Reality Tools from VPL

Virtual Reality just became much more affordable, sophisticated and standardized with VPL Research's Siggraph '91 introduction of three new systems offering users a complete range of price/performance choices.

The RB2™ Model 2, which VPL is currently shipping, is being joined by the new RB2 Advance Professional and RB2 Professional Systems, which provide the dynamics processing power and graphics rendering sophistication needed by high end users. At the other end of the spectrum is the new MicroCosm™ System (see article below).

The RB2 Advanced Professional System is an off-the-shelf simulation system that pushes the performance envelope. The RB2 Advanced Professional software, an EyePhone HRX™, a DataGlove THX™, a Spatial Tracking System and an AudioSphere™ are configured with a one SkyWriter, 4D/320 VGX, or other high end

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## MicroCosm A Personal Virtual Reality System

Later this year VPL will begin shipping MicroCosm™, an entry level VR™ system costing under \$50,000 complete. There will be two MicroCosm models, one based on the Apple Macintosh, and the other based on the Silicon Graphics IRIS Indigo. Both MicroCosms will use special peripherals and software, including the very lightweight EyePhone XVR™, the DataGlove XVR™, and, for the Indigo, Swivel XVR™.

Although there is a big difference between the performance level of MicroCosm and the big RB2 systems, it is important to keep in mind that VR-related technology has been moving so fast that the MicroCosm will actually be close in

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## VPL Software: The New Picture

Faster, more sophisticated rendering and dynamics calculation, improved connectivity, and multi-platform operability are the trends in VPL's latest Virtual Reality software.

Body Electric™ and Swivel™ are running on the IRIS. A Mac is now no longer required to run the RB2. The RB2 now uses a transparent and flexible multi-processor/multi machine strategy.

**Isaac**

Isaac™ now renders images faster by utilizing new compression and clipping algorithms that are tuned for use in Virtual

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## Services from VPL

Although VPL is primarily known as a product supplier, VPL is also growing as a service provider.

**Exhibition Services**- VPL has enjoyed broad success internationally in providing exhibition services for companies like Toshiba, Lederle Labs, Matsushita, Silicon Graphics, MicroAge Computers, and Pacific Bell. VPL will prepare a custom Virtual World for an exhibit, and provide a complete service package, including staff.

**Training Services**-VPL provides 1 and 3 day Virtual World building training classes. This service is designed to get workgroups beginning to use VR up and running in a minimum of time. Recent training session customers include NASA Johnson and Stanford Research Institute.

**Technical Consulting/Application Integration**-VPL can provide custom software and peripherals, and expertise in integrating advanced user interfaces into an application.

## New EyePhone HRX And EyePhone LX



The EyePhone HRX™ sets a new standard in high resolution head mounted display quality. The EyePhone LX™ is VPL's new standard EyePhone.

The LX and the HRX have a lot in common. Both use proprietary compound Fresnel lenses and diffusion elements to achieve unprecedented low distortion, wide angle images. Both are lower in weight than earlier immersive head mounted displays, weighing in at under 2.5 lbs complete. The LX and the HRX also share a comfortable new ergonomic design called the "Saturn Ring" mount.

## New DataGloves Include Tactile & Force Feedback

This year VPL is proudly adding four new glove models to its line of gloves and suits for Virtual Reality use. First, the DataGlove Model 2+ is a version of the classic "DG2" with enhanced durability. The big news is the new DataGlove models THX, TSR and FBX.

The DataGlove THX™ is a pneumatic tactile feedback glove. The DataGlove TSR™ is a force sensitive glove primarily used in programming the THX. The tactile technology in the THX is called TeleTact. The original TeleTact glove was developed by Airmuscle, Ltd., as part of the Verdex project for ARRL (see story on page 3). The TSR is lined with force sensitive resistors (FSR's) on its inner surfaces. When real objects are grasped, a distinct pattern of forces are generated over the FSR's. A stored proportional pressure pattern thus measured can be replayed on the DataGlove THX. The THX contains twenty pressure pads in the same positions as the input glove FSR's, as well as bend sensors. As the

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# Update: VPL's Projects and Collaborators

## Medical Media Systems

VPL is spinning off a new start-up company called Medical Media Systems. MMS is now in its initial phase and functioning as unit within VPL.

MMS will apply advances in scientific visualization, computer hardware and software to medicine. Dr. Joseph Rosen, a reconstructive surgeon, Prof. of Medicine at Dartmouth Medical School and a long time researcher in the applications of virtual reality, is spearheading the startup and will be Medical Director. VPL's Product Design Director Ann Lasko-Harvill is coordinating the start-up at VPL. Virtual Reality will be used to place the surgeon inside a smart surgical environment. Some surgical procedures are high risks because of inadequate user interfaces for the surgeon controlling advanced surgical instruments. The MMS smart surgical environment will reduce these risks, and also make poor visibility procedures possible.

## Virtual Reality Entertainment

Although no official announcement has been made, we will take this opportunity to confirm the press reports that VPL and MCA/Universal are at work on a joint project to create commercial Virtual Reality theaters.

## Hip Software

Since the announcement last year of VPL's acquisition of Hip Software Corporation, Hip's Macintosh products HookUp!™ and Harmony Grid™ have moved from the musical elite into the personal computing main stream. At only \$150, HookUp! is a great introduction to VR. The following are real quotes from a recent review in Stuart Alsop's PC Letter: "far an away the best introduction to programming that I've seen..." and "The psychic rewards of the product are substantial and I feel rejuvenated having used it". Computer visionary Ted Nelson said HookUp! is "The best software for creating interactive animation on the Macintosh." HookUp! uses icons and data flow to let even computer novices create real-time simulations. Order HookUp! direct from VPL.

## TVR: The Next Generation of Gaming!

Abrams/Gentile Entertainment and VPL Research are working together to bring out a new product, called TVR. TVR is a home video game system with head mounted game play.

TVR is a natural follow-up for the immensely successful Power Glove, a Nintendo game controller. The Power Glove was the sixth ranking toy product in dollar volume in the Christmas '89 season. Over a million buyers proved that the world is ready for consumer VR products.

## Greenleaf Medical Systems

Greenleaf Medical Systems is adapting VPL's DataGlove and DataSuit technology for medical applications. GMS is currently developing products for movement assessment and for the physically impaired in the following areas: a clinical motion testing and functional assessment program called The Motion Analysis System; assistive input technology for the physically impaired called The Gesture Control System, which GMS is currently collaborating on with Drs. Harry Murphy and Neil Scott of Cal State Northridge (CSUN); and The GloveTalker, an alternative communications device. For nfo call: (415) 321-6135.

## Swivel XVR Is Coming

Later this year VPL will introduce a new entry in the Swivel product line: Swivel XVR, for the IRIS Indigo. Swivel XVR will retain the best ease-of-use features of the Mac version, along with new features, including easy multimode editing with both traditional two dimensional on-screen editing and VR based editing using MicroCosm. Swivel, one of the world's most popular 3D programs, is the best-selling 3D program on the Macintosh, winning both the MacEddy Award and MacWorld's World Class Award. Swivel 3D, the first 3D tool to break into the mainstream of Mac users, shows up in top ten sales lists usually reserved for business applications. Versions of Swivel are marketed on the Macintosh by Paracomp under a license from VPL.

## Division

Division, Ltd. of Bristol, England has created a fully integrated virtual reality system, called PROvision, based on a specialized parallel computer using Transputers, as well as the VPL EyePhone and DataGlove. Division's VR system is particularly well suited to simulations that require large amounts of real-time calculation that can be parallelized. VPL and Division are working together to make RB2 Virtual Worlds portable to this powerful platform. Division and VPL are also cooperating on some versions of the MicroCosm system. Division has an exhibit in Tomorrow's Realities.

## NASA/Marshall Space Flight Center

The NASA/Marshall has an RB2 system up and running. They have constructed a low fidelity space station to help pathfind and check out the system. The first project is to evaluate and assess three different configurations of the space station Crystal Growth Furnace (CGF). In particular, NASA is looking at the sample change-out process to assess dynamic working envelopes and fields of view.

## DataGloves

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fingers close, the onset of pressures is replayed, and a recognizable sensation is generated for a large number of users.

## DataGlove FBX

The DataGlove FBX™, a force feedback glove, will be available in the near future. VPL is entering into an agreement with Rutgers University of New Jersey for the licensing of the force feedback mechanism used in the DataGlove FBX. The DataGlove FBX is fitted with micro-actuators producing force feedback to multiple fingers. It is light, compact, safe and desk-top. The technology was developed by a team headed by Prof. Grigore C. Burdea from the Rutgers Center for Computer Aids for Industrial Productivity (CAIP). A report will be published in the first issue of the journal "Presence" from MIT Press.



# VPL's Academic Liasons

## MIT Media Lab

In May of 1991, Dr. David Zeltzer of the MIT Media Lab, also a VPL Research consultant, and his graduate students demonstrated a virtual environment system for aircraft mission planning to a large group of technical representatives from various U.S. government agencies. The mission planner displays 3D terrain data and generates the flight paths of single or multiple aircraft using an aerodynamic model of aircraft performance. Targets, threats, and aircraft viewpoints may be selected interactively - and modified - using the VPL DataGlove. Viewing modes are selected by voice input. The mission planner can make use of both standard CRT presentation or a head-mounted display. For the demonstration, VPL was able to provide a prototype version of the new EyePhone HRX. The improved resolution offered well-defined, wide field views of aircraft and terrain features. The mission planner runs on HP 9000 series 835 workstations, and two 24-bit Turbo SRX frame buffers were used to drive the EyePhone HRX.

## HIT Lab

VPL is a Charter Member of the Virtual Worlds Consortium organized by the Human Interface Technology Laboratory (HIT Lab) of the University of Washington in Seattle. The HIT Lab, headed by VR pioneer Tom Furness, is serving as a hub of activity for the common good of the VR community. Current projects include performance benchmarks for VR systems, public domain VR software, as well some advanced development projects like the retinal scanner display. The HIT Lab also works closely with Boeing on VR applications, and collaborated on the VSX aircraft simulation, running on a VPL RB2, that can be seen in Tomorrow's Realities.

## Advanced Robotics Research, Ltd.

ARRL of England has developed the VERDEX program. The aim of the first phase of the program was to develop an experimental test bed primarily for human factors evaluations of VR and telepresence

technologies. The aim of the project is to allow the virtual reconstruction of a remote environment by using the geometric output of non-visual sensors, correlated and integrated with pre-existing CAD representations of that environment. For display, head-slaving and virtual graphics tests, work at ARRL has used a VPL EyePhone Model 2 System. The main interaction device is the DataGlove, together with the TeleTact tactile feedback technology developed by ARRL and Airmuscle Ltd.

## University of North Carolina

UNC has seven different applications for VR at the "Tomorrow's Realities Gallery" at Siggraph '91, using VPL EyePhones, a new head tracking device, and UNC's parallel graphics engine: the pixel-planes 5. The pixel-planes 5 graphics system can generate over two million triangles per second. The new head tracker is a room-sized system, which might well be the first system to track a user in a room-sized environment with sufficient speed and precision to give the user a feeling of being within an imaginary computer-generated environment.

## VR for Kids

Both VPL and the HIT Lab are supporting local classes for elementary and junior high school students who build their own worlds in the RB2 system. Look for a report in the next Virtual World News.

## ART + COM

ART + COM is a non-profit, interdisciplinary multimedia center founded in 1988 as a center for research and development of computer-assisted design and representation. The center's objective is to create professional production conditions for architects, interior designers, art designers, filmmakers and musicians. ART + COM's current projects include: Project VR Lab - building a permanent VR lab for research and applications; Project Tele-VR - in collaboration with Deutsche Bundespost, linking the computational power of ART + COM with the VPL VR equipment situated at remote sites such as exhibitions and conferences via the German fiber optics network; Interior Auto Design - by developing

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## Senate Hearings on Virtual Reality

On May 8 of this year, Senator Al Gore (D-TN), the Chairman of the Senate Subcommittee for Science, Technology and Space conducted a Senate hearing on VR. The witnesses included Dr. Tom Furness of the HIT Lab, Dr. Fred Brooks of UNC, Jaron Lanier of VPL, Dr. Charles Brownstein of the National Science Foundation, and Dr. Lee Holcomb of NASA.

The hearing was followed by demonstrations of VPL's RB2 system for senators and congressmen.

## SRI International

SRI International and VPL co-sponsored a major applications-oriented VR conference June 17-19 June, with participants from all over the world.

SRI and VPL are collaborating on some other projects as well. A four-member team has been assembled to produce a virtual-workplace demonstration system. NASA/Ames and SRI will identify the perceptual requirements; the David Sarnoff Research Center will develop data visualization; and VPL Research will implement virtual worlds and develop protocols for interactive physics. The initial embodiment of this virtual workplace will demonstrate remote interactions among users who are maintaining or modifying complex assembly. Users will be able to both jointly view and manipulate models of multidimensional data, still images, and videostreams. One focus of the proposed work is to develop a protocol for virtual-workplace systems that is structured in accordance with the perceptual requirements of the users as well as with the capabilities of available technologies.

## For next time...

Unfortunately, space limitations prevent us from printing the latest news from some of our other collaborators. Scott Foster of Crystal River Engineering will be showing some of the latest work on the Convolvotron (used in the VPL AudioSphere) at Tomorrow's Gallery at Siggraph '91. Mark Bolas of Fake Space, who provides VPL with Telepresence equipment will also be there. Next issue will have more news from these and others.



## VPL Software

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Reality. Isaac's rendering options now include radiosity and texture mapping. Isaac now supports the SGI Video Splitter with both mono separated or stereo separated images. StereoGraphics shutter glasses are also supported with or without head-tracking for high resolution viewing of virtual realities on workstation monitors.

### Body Electric

Body Electric now generates faster code and has a stronger data abstraction mechanism.

Body Electric Professional, shipping in the first quarter of 1992, will support improved host communications, and an easy internal interface for importing code developed in other environments.

### Libraries and Virtualization

Another new development is that VPL will begin to distribute RB2 Virtual World libraries. Physically-based dynamics simulations and advanced hand-object articulation examples for Body Electric and Anatomical 3D models for Virtualization are examples.

And lastly, Virtualization™, VPL's 3D model processor is being introduced. Aside from importing data from all common sources, the data is interactively processed for optimized use in VR.

## VPL International France

**Vecsys**-VPL's distributor in France for the military, aerospace research, and some other industrial markets. **VECSYS** is also the supplier of the standard speech recognition equipment used in the VPL RB2: the Vecsys DATAVOX.

**Videosystem**-VPL's distributor in France for animation and related markets. Videosystem also maintains a lovely showroom for the VPL RB2 in Paris.

## Japan

**Nissho Electronics**-VPL's distributor in Japan. Nissho also maintains a showroom for the RB2 in Tokyo. Nissho has worked with customers like Matsushita in Japan to create some of the most challenging and interesting applications of VR.

## RB2 Systems

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SGI workstations (dual workstation configurations are optional).

The RB2 Professional System includes the RB2 Professional software, an EyePhone LX™, a Spatial Tracking System and a DataGlove Model 2+™. A prototype of the RB2 Professional is being demonstrated at the VPL Siggraph booth. Shipments of the Advanced Professional and Professional Systems will start in first quarter of 1992.

The RB2 Advanced Professional and Professional Systems provide enhanced performance by utilizing multi-processor SGIs for calculating dynamics and graphics in parallel on separate processors. The RB2 Model 2, on the other hand, distributes processing task over multiple workstations on a network.

All RB2 and MicroCosm Systems are software compatible.

### MicroCosm

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performance to the original VPL RB2 systems of the late eighties. Also, MicroCosm will come with the complete RB2 authoring tools, so it will be easy to design for and libraries of virtual worlds will be immediately available.

MicroCosm is suitable to a range of applications, although the range is not as large as that addressed by the high end RB2. MicroCosms can be expected to be used extensively in education, as development stations for the RB2, and for VR industrial applications where a lower graphics rendering capability is acceptable, such as robotic programming and animation design.

## Germany

**Art+Com**-aside from being a major VR R&D site Art+Com is a VPL customer support site. Though not a distributor, they will help with all aspects of RB2 use in Germany.

### VPL's Liasons

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a setup for the design and testing of car interiors to check the capability of VR

## A Guide to the Virtual Worlds VPL Is Showing at Siggraph

VPL sells tools not demos. VPL worlds are honest: VPL never shows a world that a user could not make using our standard tools. Here's some info about some of the worlds we are showing at Siggraph:

There will be a number of worlds showing off radiosity and textured rendering. Of special interest is a **Subway Station** model created by Art+Com. The station was buried under the Berlin Wall for 40 years. The texture/radiosity models started out in Wavefront, MultiGen, or Swivel. There is also a **Gallery** exhibit allows you to add your own sculpture.

Another world of special interest is a simulated house that visitors can try when they visit **Matsushita's Virtual Kitchen** sales room in Tokyo. Interesting things to try include breaking a dish in the kitchen, putting your head under the faucet, and tuning the radio to the Sumo match. Note that the Matsushita simulated house/kitchen is western in style: a **Japanese House** exists to visit, but it was designed at the Art Center College of Design in Pasadena, Ca, which is beginning a Virtual World design curriculum.

You can fly through **Cell-Sort Data**. Luika Timmerman and her colleagues at Stanford collected the experiment data.

In the donut shaped Virtual Casino you can find a slot machine (modeled by Ann Lasko from an antique), a piano, a set of peculiar dominoes, some venetian blinds, a strange girl, and other diversions.

As you tour through the worlds, you'll notice a ball near the periphery of your visual field. When you grab the ball, it starts to blink and expand into a **Tool Chest** with a variety of useful tools. You carry the chest like a tool belt when you travel from world to world.

systems in this field; Project Stoa of Berlin - an active scenario in the virtual environment of Mies van der Rohe's National Gallery.